

Claims

1. A method for producing sealed capsules (C), each defined by a body (1) coupled with a lid (2), the method at least comprising the steps of filling the capsule body (1) with a quantity or dose (3) of material and closing the capsule (C) by placing the lid (2) over the body (1) so that their respective annular ends (1a, 2a) overlap; the method being characterised in that it further comprises a step of applying a sealing substance to at least one of the overlapped ends (1a, 2a) of the capsule body (1) and lid (2), said sealing step being performed before the capsule (C) is closed.
2. The method according to claim 1, characterised in that the step of applying the sealing substance is performed at substantially the same time as the lid (2) overlaps the respective body (1).
3. The method according to claim 1, characterised in that the step of applying the sealing substance is performed immediately after the lid (2) partially overlaps the respective body (1).
4. The method according to any of the foregoing claims from 1 to 3, characterised in that the step of applying the sealing substance is performed while rotating at least the capsule body (1) about its longitudinal axis (Z) in such a way as to apply the sealing substance to the annular end (1a) of the body (1) itself.
5. The method according to any of the foregoing claims from 1 to 3, characterised in that the step of applying the sealing substance is performed while rotating both the body (1) and lid (2) about the longitudinal axis (Z) in such a way as to apply the sealing substance to both the annular ends (1a, 2a) of the body (1) and lid (2) themselves.
6. The method according to any of the foregoing claims from 1 to 5, characterised in that the step of applying the sealing substance is accomplished by spraying.
7. The method according to any of the foregoing claims from 1 to 6, characterised in that the sealing substance comprises an aqueous mixture comprising at least water and ethanol.
8. The method according to any of the foregoing claims from 1 to

6, characterised in that the sealing substance comprises a cellulose based liquid substance.

9. The method according to any of the foregoing claims from 1 to 6, characterised in that the sealing substance comprises a gelatin based liquid substance.

10. The method according to any of the foregoing claims from 1 to 9, characterised in that the step of closing the capsule (C) is followed by a step of drying the sealed capsule (C) while the latter is held in a stable position.

11. The method according to claim 10, characterised in that the drying step is performed during the step of transferring the capsules (C) towards capsule collection containers.

12. A capsule filling machine (4) for the production of sealed capsules (C) of the type with lid (2) and body (1) containing pharmaceutical material, the machine (4) being of the type comprising a station (5) for feeding the capsule bodies (1) and lids (2); a dosing station (6) for filling a dose of the material into each capsule body (1); and a station (7) for closing the capsules (C) by placing each lid (2) over the respective body (1) so that their respective annular ends (2a, 1a) overlap; the machine (4) being characterised in that between the dosing station (6) and the closing station (7) there is at least one intermediate operating station (8) for applying a sealing substance in the vicinity of the ends (1a, 2a).

13. The machine according to claim 12, characterised in that the intermediate operating station (8) comprises, one after the other, a substation (9) for precoupling the capsule bodies (1) and lids (2) to each other, and a substation (10) for applying the sealing substance.

14. The machine according to claim 12 or 13, characterised in that it comprises a first turret (11) for moving the capsules (C) along a circular path (P) extending at least through the feed and dosing stations (5, 6), the intermediate station (8) comprising a second, independent turret (12) that rotates about an axis (Z') in order to position the capsules (C) at the precoupling substation (9), at the substation (10) for applying the sealing substance and at the closing station (7); the second turret (12) being equipped

with a plurality of means (13) for retaining the capsules (C), mounted radially on the second turret (12) and acting in conjunction with means (14) for handling the body (1) and lid (2).

15. The machine according to claim 14, characterised in that the
5 handling means (14) are located in the vicinity of the retaining means (13), move vertically in both directions and are equipped with first means (15) for creating a vacuum which enable the following steps to be carried out, respectively, along a rotational path (P1) of the second turret (12): picking up and
10 transferring the bodies (1) and lids (2) to the second turret (12) positioned in such a way that they partially overlap each other, that is to say, with their ends (1a, 2a) in contact at the retaining means (13); rotating the capsule bodies (1) and lids (2) at the substation (10) for applying the sealing substance in such
15 a way as to spread the sealing substance evenly; and closing the capsules (C) by moving the bodies (1) and the respective lids (2) closer together.

16. The machine according to claim 14 or 15, characterised in that the retaining means (13) comprise, for each capsule (C), a
20 concave end seat (13a), located on the second turret (12), for accommodating the capsule body (1) and lid (2); the seat (13a) having a central cavity (13b) for separating two portions of the seat (13a) and having leading into them respective radial conduits (16, 17) connected to second means (18) for creating a vacuum
25 which enable them to retain the portion of the respective body (1) and lid (2) when the body (1) and lid (2) themselves move to the substations (9, 10) and to the closing station (7).

17. The machine according to one of the claims from 14 to 16, characterised in that the handling means (14) comprise, at the
30 precoupling substation (9), a pair of hollow cylindrical pins (19, 20) located on opposite sides of the second turret (12) and equipped with the first vacuum means (15); the cylindrical pins (19, 20) being equipped with handling means (21) for enabling stable contact, on both sides, with the body (1) and lid (2)
35 positioned on the first turret (11) so as to transfer them to the second turret (12) in a vertical direction while partially overlapping the body (1) and lid (2).

18. The machine according to one of the claims from 14 to 17, characterised in that the handling means (14) comprise, at the sealing substation (10), at least one cylindrical pin (22) for coming into contact with the bottom of a body (1) through the first vacuum means (15) and rotating the partly overlapped bottom (1) and lid (2) about the longitudinal axis (2).

19. The machine according to one of the claims from 14 to 18, characterised in that the sealing substation (10) comprises at least one spray nozzle (23) facing a respective capsule body (1) and/or lid (2) as the second turret (12) rotates them; the nozzle (23) being positioned at the overlapping annular ends (1a, 2a) of the body (1) and lid (2) in such a way as to uniformly spray the sealing substance on the overlapping ends (1a, 2a) themselves.

20. The machine according to claim 19, characterised in that the nozzle (23) is designed to spray an aqueous mixture comprising at least water and ethanol.

21. The machine according to claim 19, characterised in that the nozzle (23) is designed to spray a cellulose based liquid substance.

22. The machine according to claim 19, characterised in that the nozzle (23) is designed to spray a gelatin based liquid substance.

23. The machine according to one of the claims from 14 to 22, characterised in that the handling means (14) comprise, at the closing station (7), a pair of hollow cylindrical pins (24, 25) located on opposite sides of the second turret (12) and equipped with the first vacuum means (15) for holding the body (1) and lid (2); the cylindrical pins (24, 25) being equipped with straight-line handling means (21) not only to enable stable contact with the body (1) and lid (2) on both sides but also to apply an opposite force on them so as to fully close the capsule (C); at least the pin (24) being equipped with rotational handling means (26) so as to impart a twisting movement to the capsule (C) while it is being closed.

24. The machine according to any of the foregoing claims from 12 to 23, characterised in that it further comprises a station (27) for drying the sealed capsules (C), the drying station (27) being located downstream of the closing station (7) on the circular feed

path (P1) followed by the capsules (C).

25. The machine according to claim 24, characterised in that the drying station (27) comprises a capsule (C) conveyor belt (28) located in the vicinity of and under the second turret (12) that seals and closes the capsules (C); the belt (28) having on its surface a plurality of seats (29) each designed to accommodate a single capsule (C) to be transferred by respective handling means (14) from the closing station (7) to one of the seats (29) in a vertical direction (V) in such a way as to keep the capsule (C) in a stable position.